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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,639	01/15/2002	Whonchee Lee	150.00560104	6476

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EXAMINER
DEO, DUY VU

ART UNIT	PAPER NUMBER
1765	4

DATE MAILED: 04/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

4

Office Action Summary	Application No.	Applicant(s)	
	10/050,639	LEE ET AL.	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *46-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *68-75* is/are allowed.

6)☒ Claim(s) *46 and 50-67* is/are rejected.

7)☒ Claim(s) *47-49* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 46-75 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-42 of U.S. Patent No. 6,074,960. Although the conflicting claims are not identical, they are not patentably distinct from each other because they describe the same method for forming cobalt silicide by using wet etching on the substrate.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 46, 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US 5,482,895).

Hayashi teaches a method of manufacturing semiconductor devices including steps: providing a substrate assembly comprising a metal nitride region and a cobalt silicide region; selectively etching the metal nitride against the cobalt silicide using a solution comprising a peroxide (col. 10, line 21-62). Unlike claimed invention, Hayashi doesn't describe the etch rate of the metal nitride from 50-250 angstrom/min. However, the etch rate of the metal nitride depends on the chemical concentration in the solution in which the concentration would have to be determined through test runs in order to achieve the optimum chemical concentration in the solution to etch the metal nitride with an anticipation of an expected result.

5. Claims 50-56, 58 and 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi as applied to claim 46 above and further in review of Berti et al. (US 5,567,651).

Referring to claims 50, 51 Hayashi doesn't describe the solution containing a mineral acid to etch the TiN. Berti teaches a method of etching metal nitride and cobalt wherein he teaches removing the cobalt and TiN using an etchant containing a mineral acids such as phosphoric, acetic, and nitric acid and hydrogen peroxide (col. 3, line 50-55). It would have been obvious at the time of the invention for one skill in the art to modify Hayashi's method in light of Berti's teaching using an etchant containing a mineral acid and hydrogen peroxide to remove TiN because, as shown above by Hayashi, the solution of mineral acid and hydrogen peroxide would also remove cobalt. This would saves time during removing process, and reduce contamination since one type of solution is used for removing both cobalt and TiN.

Referring to claim 52, it would have been obvious for one skill in the art to use other mineral acid that is well known to one skill in the art such as HCl to etch the cobalt and TiN with an anticipation of an expected result.

Referring to claims 53-56, 58 and 59, above prior art doesn't disclose the solutions removing TiN and cobalt having deionized water. It would have been obvious that it is within one skill of the art at the of the invention through routine experimentation to dilute the solution with an appropriate amount of deionzied water creating a concentration of mineral acid and peroxide that would optimize the removing process of metal nitride and cobalt against the cobalt silicide with an anticipation of an expected result.

6. Claims 60-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 5,047,367) and Berti et al. (US 5,567,651).

Wei describes a method of forming a semiconductor device comprising providing a substrate having a metal nitride and a cobalt region and selectively etching cobalt region against the metal nitride region using a solution of mineral acid and water (col. 7, line 53-col. 8 line 5). Unlike claimed invention, Wei doesn't describe the solution containing a peroxide. Etching cobalt using a solution having peroxide is well known to one skill in the art as shown here by Berti who teaches a method of etching metal nitride and cobalt wherein he teaches removing the cobalt and TiN, using an etchant containing hydrogen peroxide, selectively against cobalt silicide (col. 3, line 50-55). It would be obvious at the time of the invention cobalt can be etched in light of Berti because Berti describes an alternative solution where peroxide is added to etch the cobalt against the cobalt silicide with an anticipation of an expected result.

Even though, Berti doesn't describes the solution removes cobalt selectively against TiN; however, at the time of the invention, it would be well known to one skill in the art that different material is removed at different rate by a same solution and the etch rate is also depended on the chemical concentration in the solution. Therefore, referring to claims 64-67, the concentration of

the chemicals would have to be determined through test runs in order to achieve the optimum chemical concentration in the solution to achieve an optimum etch rate of the cobalt with an anticipation of an expected result.

Referring to claim 62, it would have been obvious for one skill in the art to use other mineral acid that is well known to one skill in the art such as HCl to etch the cobalt with an anticipation of an expected result.

Allowable Subject Matter

7. Claims 68-75 are allowed because Hayashi doesn't describe forming the cobalt silicide and cobalt regions on a metal nitride layer. He describes the metal nitride is formed on the cobalt silicide and cobalt layer in order to prevent oxidation of the cobalt film and a good silicide film can be obtained.

8. Claim 47 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 47 is allowable for the same above reason.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
April 3, 2002

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